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INSTALLATION RESTORATION PROGRAM

AD-A231 853

PRELIMINARY ASSESSMENT

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Connecticut Air National Guard
103rd Tactical Fighter Group (TFG)
Bradley International Airport
Windsor Locks, Connecticut

103rd Tactical Control Squadron (TCS)
Orange and West Haven, Connecticut

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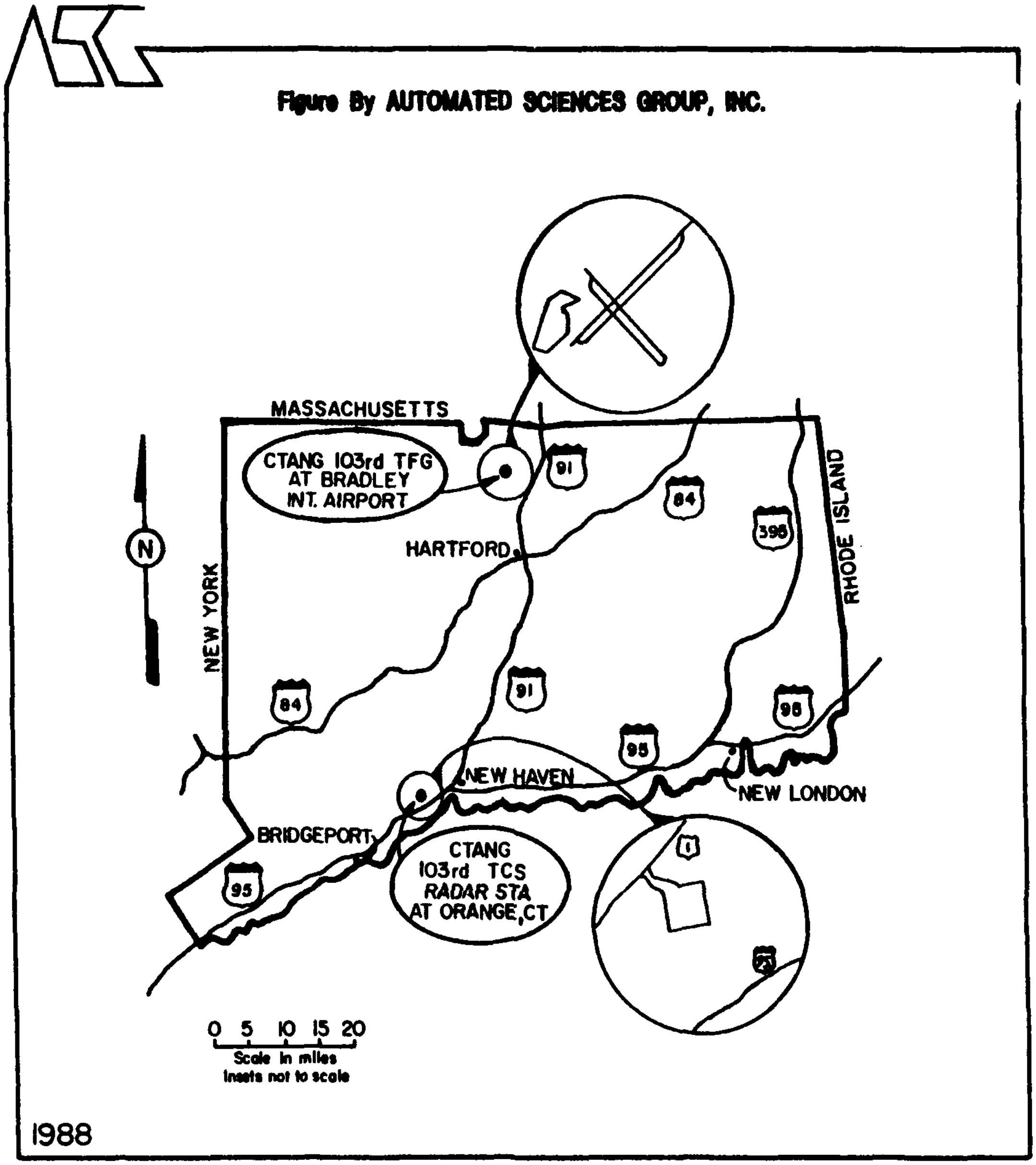

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PRELIMINARY ASSESSMENT

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BRADLEY INTERNATIONAL AIRPORT
WINDSOR LOCKS, CONNECTICUT
AND
103rd TACTICAL CONTROL SQUADRON (TCS)
ORANGE/WEST HAVEN, CONNECTICUT

NOVEMBER 1988

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EXECUTIVE SUMMARY

A. INTRODUCTION

The Automated Sciences Group, Inc. (ASG) was retained by the HAZWRAP Support Contractor Office (SCO) in June 1988 to conduct the Preliminary Assessment (PA) phase of the Installation Restoration Program (IRP) of the 103rd Tactical Fighter Group (TFG), Connecticut Air National Guard (CTANG), Bradley International Airport, Windsor Locks, Connecticut (hereinafter referred to as the Base), and the 103rd Tactical Control Squadron (TCS), Connecticut Air National Guard, Orange/West Haven, Connecticut (hereinafter referred to as Station), under contract No. DE-AC05-87OR21642. The Preliminary Assessment included the following:

- An onsite visit to the 103rd TFG that included interviews with 16 past and present Base personnel and 1 state employee conducted by ASG personnel from 1-5 August 1988.

- An onsite visit to the 103rd TCS that included interviews with 3 Station personnel and 1 state employee conducted by ASG personnel on 4 August 1988.

- The acquisition and evaluation of pertinent information and records on industrial chemical usage and storage and past waste generation and disposal at the 103rd TFG and the 103rd TCS.

- The acquisition and evaluation of available geologic, hydrologic, meteorologic, and environmental data from pertinent federal, state, and local agencies.

- The identification and assessments of potential sites at the 103rd TFG and the 103rd TCS that may have been contaminated with hazardous materials/wastes.

B. MAJOR FINDINGS

The major operations of the Base and the Station that have used and disposed of industrial chemical materials/wastes include aircraft maintenance; aerospace ground equipment (AGE) maintenance; ground vehicle maintenance; petroleum, oil, and lubricant (POL) management and distribution; and air weapons control. The operations involve such activities as corrosion control, nondestructive inspection (NDI), fuel cell maintenance, engine maintenance, hydraulics, structural repair, and wheel and tire maintenance. Waste oils, recovered fuels, paint wastes, spent cleaners, acids, strippers, and solvents were generated by these activities.

C. CONCLUSIONS

Past handling activities involving potentially hazardous materials/wastes have resulted in no potentially contaminated disposal/storage/spill sites within the present leased boundaries of either the Base or the Station.

D. RECOMMENDATIONS

No further investigative stages of the IRP process are warranted within the present leased boundaries of the Base or the Station.

I. INTRODUCTION

A. BACKGROUND

The 103rd Tactical Fighter Group (TFG), Connecticut Air National Guard (CTANG) is located at the Bradley International Airport, Windsor Locks, Connecticut. The airport is a state-owned facility situated adjacent to the western city limits of Windsor Locks and has been used by the Base since 1939. Over the years the types of military aircraft based and serviced there have varied and have included both piston and turbine powered aircraft.

The Base maintains a satellite radar operation located at Orange/West Haven, Connecticut. This operation is the 103rd Tactical Control Squadron (TCS). The function of the 103rd TCS is to provide air traffic control for military aircraft. This facility was built by the U.S. Army in 1957. The Station was transferred to the CTANG in 1962.

Both past and present operations at both locations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of the resultant wastes, the National Guard Bureau (NGB) has implemented its Installation Restoration Program (IRP).

The Department of Defense (DoD) Installation Restoration Program (IRP) is a comprehensive program designed to:

- o identify and fully evaluate suspected problems associated with past hazardous waste disposal/storage/spill sites on DoD installations, and
- o control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA, Public Law 96-510), commonly known as "Superfund". In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via Executive Order (EO) 12316. As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 on 11 December 1981 that reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the USEPA Superfund programs were essentially the same, differences in the definition of program phases and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On 23 January 1987, Presidential Executive Order (EO) 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

> Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all the provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan (NCP) [40 CFR 300], listing on the National Priorities List (NPL), and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the USEPA under Superfund authority.
>
> Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration

Program (DERP). This was accomplished by adding Chapter 160, Sections 2701-2707 to Title 10 United States Code (10 USC 160).

SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the USEPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

Preliminary Assessment (PA) - A Records Search is conducted that is designed to identify and evaluate past disposal/storage/spill sites that might pose a potential and/or actual hazard to public health, welfare, or the environment.

Site Inspection/Remedial Investigation/Feasibility Study (SI/RI/FS) - The SI consists of field activities designed to confirm the presence or absence of contamination at the sites identified as a result of the PA. The RI consists of field activities designed to quantify the types and extent of contamination present, including migration pathways.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests are required that may necessitate the installation of monitoring wells or the collection and analyses of water, soil, and/or sediment samples. Careful documentation and quality control procedures, in accordance with CERCLA/SARA guidelines, ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, ground-water flow rates, and probable direction of contamination migration. The findings from these studies result in the selection of one or more of the following options:

- o No further action - Investigations do not indicate harmful levels of contamination and do not pose a significant threat to human health

or the environment. The site does not warrant further IRP action and a Decision Document (DD) will be prepared to close out the site.

- Long-term monitoring - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

- Feasibility Study - Investigations confirm the presence of contamination that may pose a threat to human health and/or the environment, and some form of remedial action is indicated. The FS is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on a Base. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action by the ANG with concurrence by state and/or federal regulatory agencies.

Remedial Design/Remedial Action (RD/RA) - The RD involves formulation and approval of the engineering designs required to implement the selected remedial action. The RA is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated ground water, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

Research and Development (R&D) - R&D activities are not always applicable for an IRP site, but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that can not be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

Immediate Action Alternatives - At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate actions, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. PURPOSE

The purpose of this IRP Preliminary Assessment is to identify and evaluate potential sites associated with past waste handling/disposal procedures at the Base/Station and to assess the potential for the migration of contaminants. Relevant information collected and analyzed by the ASG site team as a part of the PA included the history of the Base/Station with special emphasis on the history of the shop operations and their past hazardous materials/waste management procedures; the local geologic, hydrologic, and meteorologic conditions that may affect migration of potential contaminants; local land use, public utilities, and zoning requirements that affect the potential for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. SCOPE

The scope of this PA is limited to the identification of past disposal procedures and/or spill sites on the Base and the Station or on property for which the Air National Guard was the sole user, and include:

- o an onsite visit to the Base and the Station;
- o the acquisition of pertinent information and records on hazardous materials use and past hazardous waste generation and disposal practices at the Base/Station in order to establish the source and characteristics of hazardous wastes or spills;
- o the acquisition of available geologic, hydrologic, meteorologic, land use and zoning, critical habitat, and utility data from various federal, state of Connecticut, and local agencies in order to establish potential pathways and receptors of hazardous wastes or spills;
- o a review and evaluation of all information obtained;
- o the identification of possible contaminant sources, migration pathways, and receptors of said contaminants; and
- o the preparation of a report.

The on-site visits, interviews with past and present Base/Station personnel, and meetings with local agency personnel were conducted during the period 1-5 August 1988. The ASG effort was conducted by the following individuals.

- o Mr. David R. Styers, Chemist/Civil Engineer/Health Physicist;
- o Mr. William L. Condra, Senior Environmental Engineer; and
- o Mr. T. Ward Dilworth, Geologist/Civil Engineer.

Resumes are included as Appendix A.

Individuals from the ANG Support Center and the Base/Station who assisted in the Preliminary Assessment included:

- o Mr. Lee Banicki, Project Officer, ANGSC/DER;
- o COL Donald Joy, 103rd TFG/CC, Wing Commander;
- o MAJ Anthony Maida, II, CTANG, Base Civil Engineer;
- o CPT Michael Lilya, CTANG, Assistant Base Civil Engineer;
- o TSgt Richard Kanode, CTANG, Environmental Health Technician; and
- o Other selected members of the CTANG.

The Point of Contact at the Base/Station was CPT Michael Lilya.

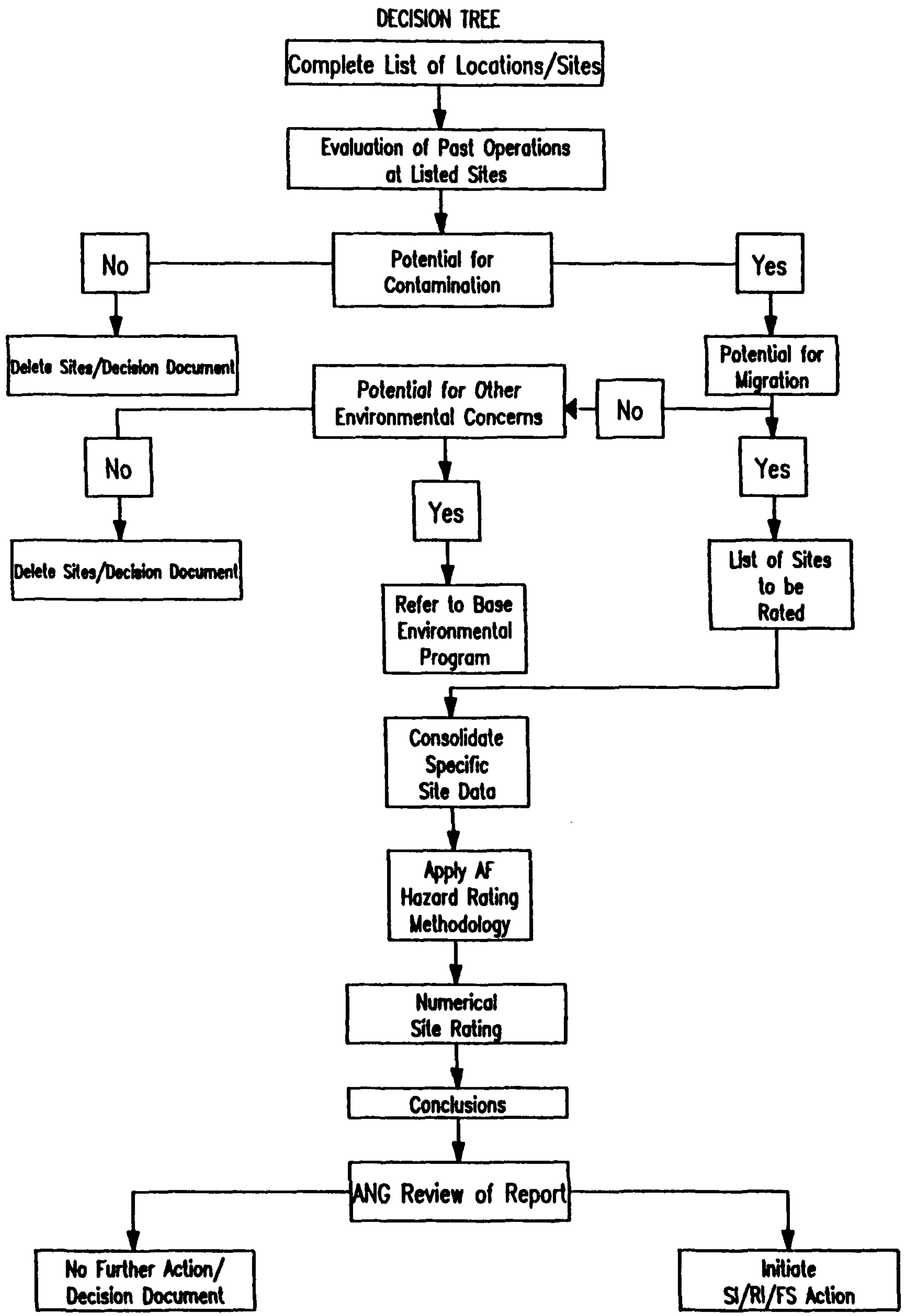
D. METHODOLOGY

A flow chart of the IRP Preliminary Assessment (PA) methodology is presented in Figure 1. This PA methodology, to the greatest extent possible, ensures a comprehensive collection and review of pertinent site specific information and is utilized in the identification and assessment of potentially contaminated hazardous waste spill/storage/disposal sites.

The PA began with site visits to the Base/Station to identify all shop operations or activities on the Base/Station that may have utilized hazardous materials or generated potentially hazardous wastes. Next, an evaluation of past and present hazardous materials/wastes handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of past practices was facilitated by extensive interviews with 19 past and present Base/Station personnel and 2 state employees who had an average of 25 years tenure with the various operating procedures at the Base/Station. These interviews were also utilized to define the areas on the Base/Station where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released to the environment in order to establish potential pathways for migration.

PRELIMINARY ASSESSMENT

Figure 1
Methodology Flow Chart



Historical records contained in the Base/Station files were collected and reviewed to supplement the information obtained from interviews. Using the information outlined, a tentative list of past waste spill/disposal/storage sites on the Base/Station was compiled for further evaluation. A general survey tour of the identified spill/disposal/storage sites, the Base/Station, and the surrounding areas was conducted to determine the presence of any visible contamination and to help assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches, surface water bodies, residences, and wells in order to establish potential pathways for migration.

Detailed geologic, hydrologic, meteorologic, developmental (land use and zoning), and environmental data for the area of study were also obtained from appropriate federal, state, and local agencies, as identified in Appendix B, for the purpose of establishing potential receptors of hazardous wastes or spills. Following a detailed analysis of all the information obtained, no sites within the present leased boundaries of the Base/Station were identified as being potentially contaminated with hazardous materials as the result of past waste handling activities at the Base/Station. A description of the Air Force Hazard Assessment Rating Methodology (HARM) is presented in Appendix C to illustrate how a Hazard Assessment Score (HAS) would have been derived if there had been any potentially contaminated sites on the Base/Station. Appendix D contains a list of storage tanks located within the present leased boundaries of the Base/Station.

II. INSTALLATION DESCRIPTION

A. LOCATIONS

The 103rd Tactical Fighter Group (TFG) of the CTANG is located at the Bradley International Airport, approximately two miles west of the center of Windsor Locks, Connecticut. The airport is located approximately 15 miles north of Hartford, Connecticut. The Base occupies 124 acres of exclusive-use lands in the southwest quadrant of the airport complex. A majority of the land within a one mile radius of the Base is zoned as commercial/industrial.

A satellite radar operation, the 103rd Tactical Control Squadron (TCS), is situated on 22 acres of land near Orange and West Haven, Connecticut, approximately 45 miles south-southwest of the Bradley International Airport. A majority of land within a one mile radius of the Station is zoned residential/commercial.

Figure 2 shows the locations of the CTANG's 103rd TFG, Bradley International Airport, Windsor Locks, Connecticut, and the 103rd TCS, Orange/West Haven, Connecticut. Figure 3 shows the immediate surrounding area of the 103rd TFG at Windsor Locks, Connecticut, while Figure 4 shows the 103rd TCS and its environs near Orange/West Haven, Connecticut. Figures 5 and 6, respectively, show the present leased boundaries for the 103rd TFG and the 103rd TCS.

B. ORGANIZATION AND HISTORY OF OPERATIONS

The present day 103rd TFG of the CTANG traces its origin back to the 118th Squadron, 43rd Air Division, which was activated at Kelly Field, Texas, in August 1917. In October 1923 this unit was relocated to Brainard Field, Hartford, Connecticut. The 118th Squadron was redesignated as the 118th Observation Squadron in May 1926. In January 1944 its name was changed to the 118th Tactical Reconnaissance Squadron.

Figure By AUTOMATED SCIENCES GROUP, INC.

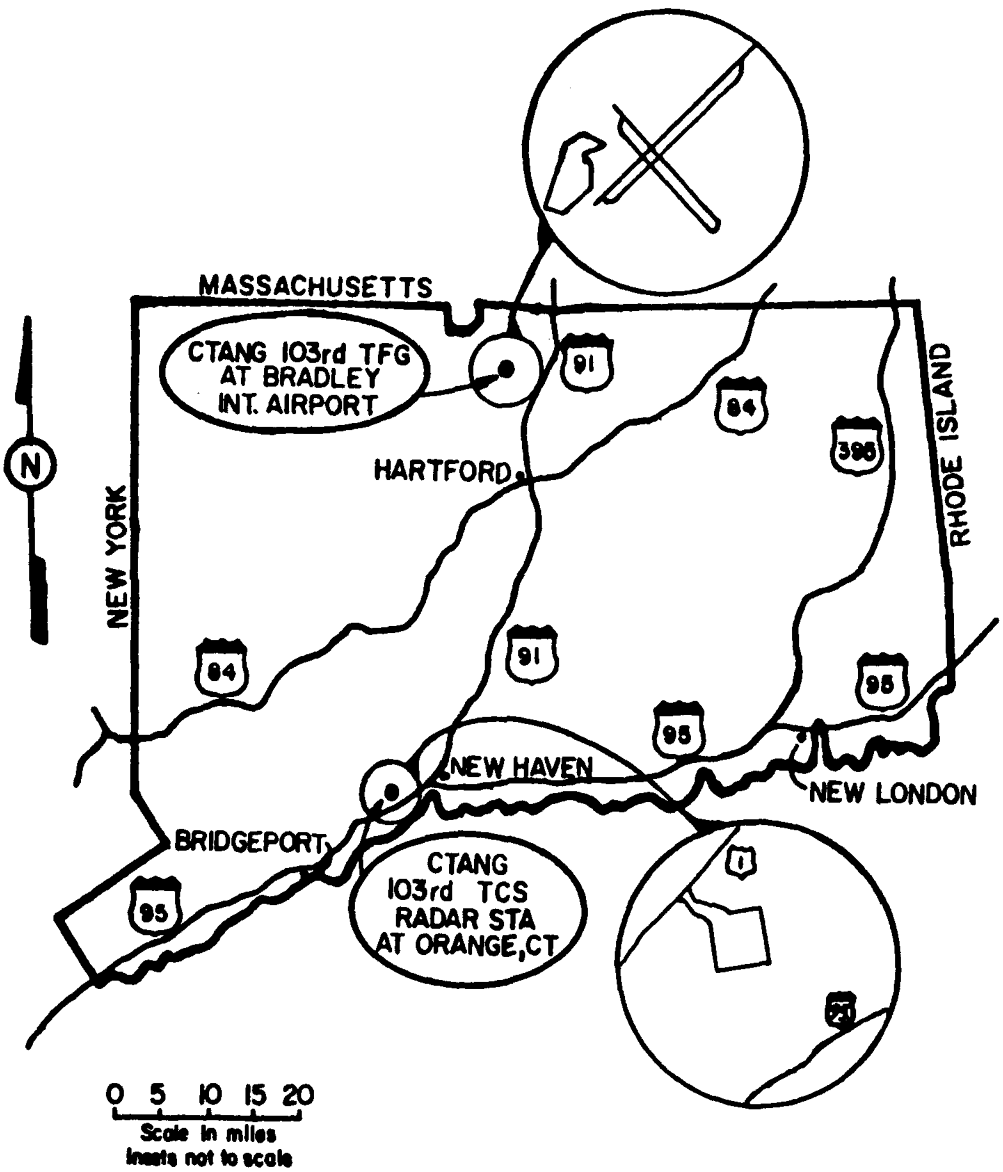


Figure 2. Map of Connecticut Showing Approximate Locations of the 103rd TFG and the 103rd TCS, Connecticut Air National Guard, Bradley International Airport, Windsor Locks, Connecticut (1988).

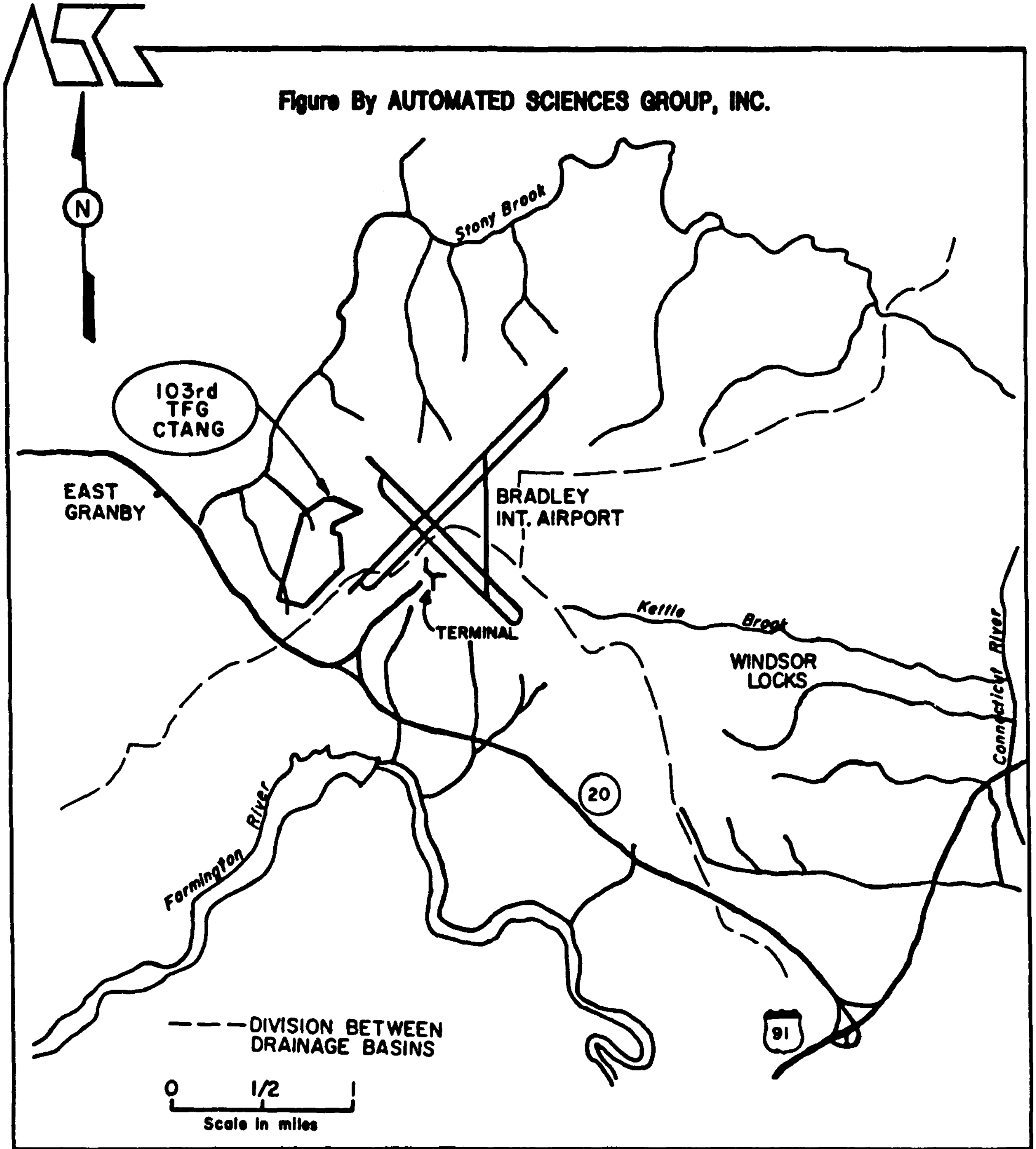


Figure 3. Site Location Map of the 103rd TRG, Connecticut Air National Guard, Bradley International Airport, Windsor Locks, Connecticut (1988).

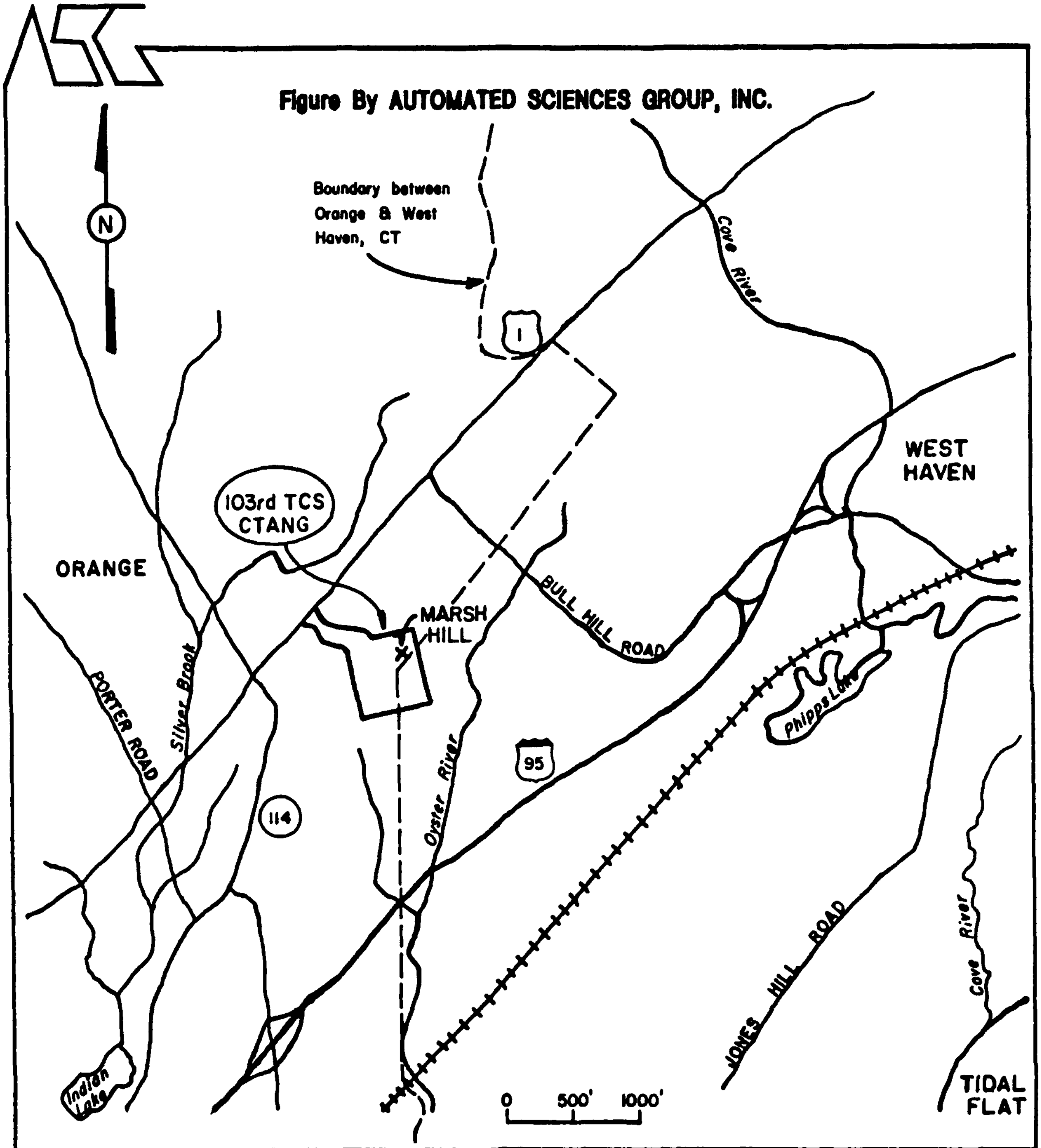


Figure 4. Site Location Map of the 103rd TCS, Connecticut Air National Guard, Orange and West Haven, Connecticut (1988).

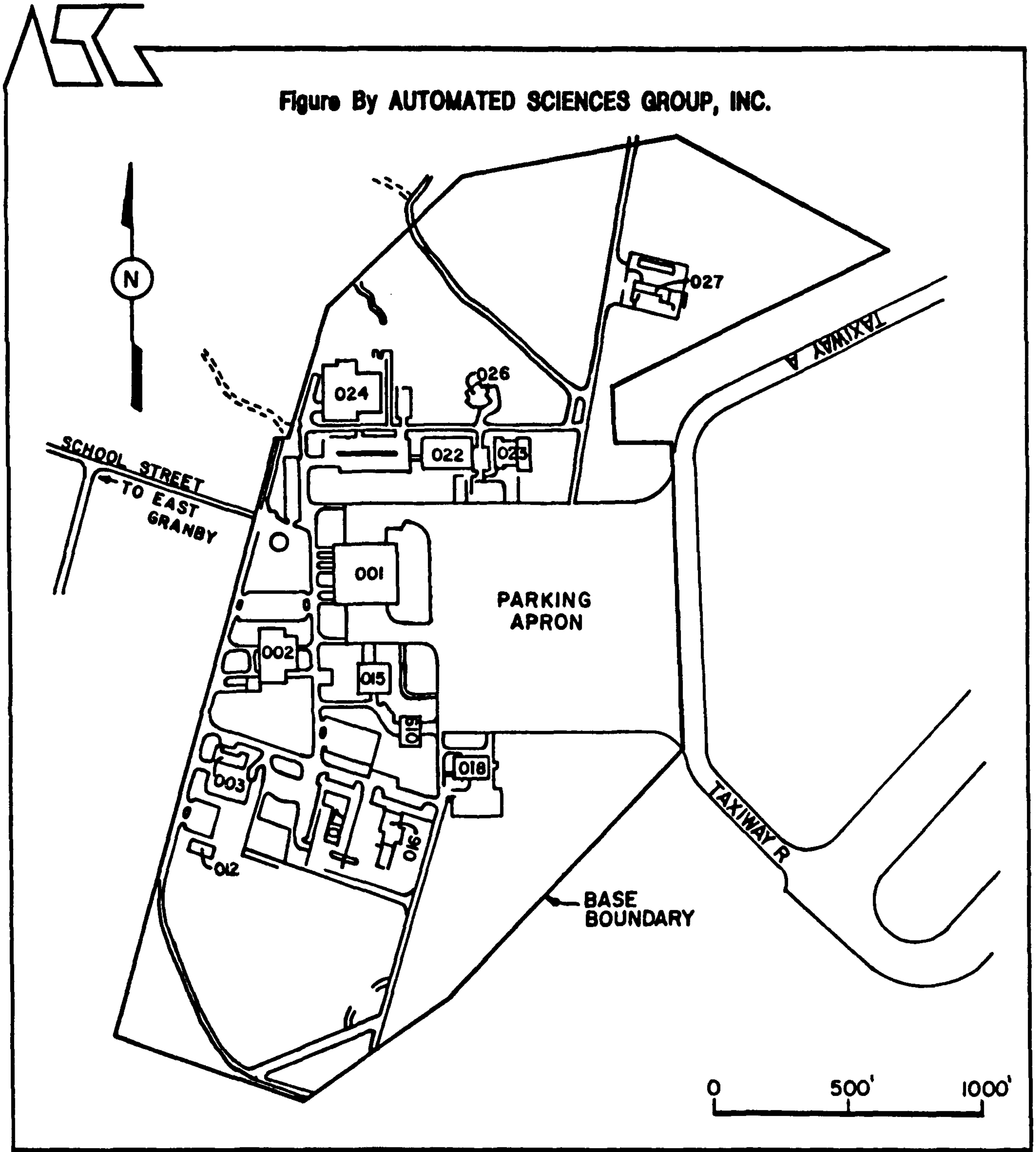


Figure 5. Base Boundary Map of the 103rd TFG, Connecticut Air National Guard, Bradley International Airport, Windsor Locks, Connecticut (1988).

Figure By AUTOMATED SCIENCES GROUP, INC.

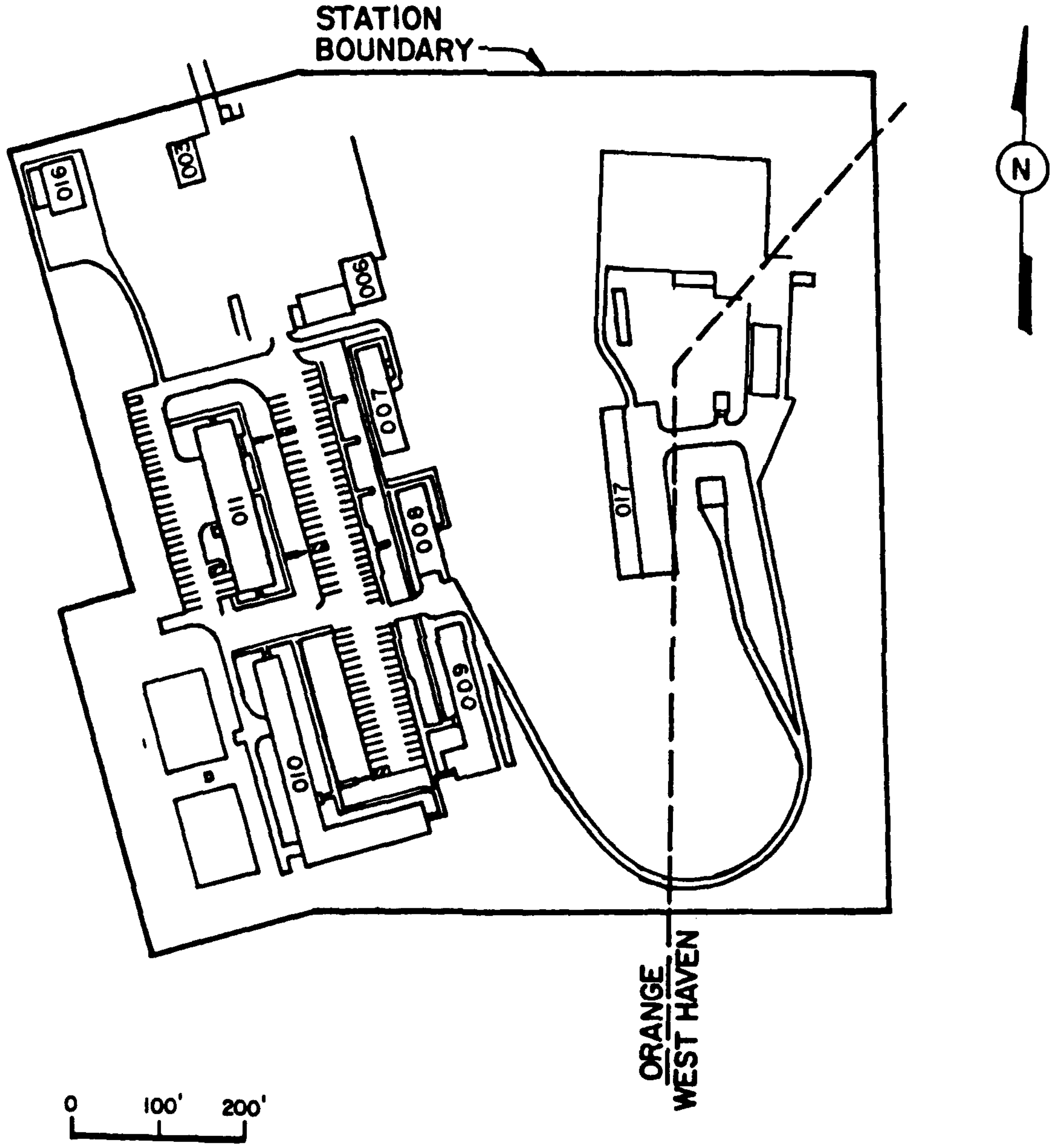


Figure 6. Station Boundary Map for the 103rd TCS, Connecticut Air National Guard, Orange and West Haven, Connecticut (1988).

In August 1946, the modern CTANG was formed as the 103rd Fighter Group and was composed of the 118th Tactical Reconnaissance Squadron and the Rhode Island 102nd Fighter Squadron. Home base for the 103rd Fighter Group was Bradley Field, Windsor Locks, Connecticut. In March 1951, the 103rd Fighter Group became the 103rd Fighter-Interceptor Wing. At the end of the Korean Conflict, the Interceptor Wing became the 103rd Fighter-Bomber Wing. Shortly thereafter, its designation reverted back to the 103rd Fighter-Interceptor Wing. The present designation, the 103rd Tactical Fighter Group, was received in 1971.

A variety of aircraft have been flown by the CTANG since its inception in 1917. From 1924 to 1932, Curtiss "Jenny" types were flown by the 118th Squadron. From 1932 to 1942, the 118th Observation Squadron flew O-11s, O-38s, and O-43s. P-40s were flown from 1942 until 1947. The F-series aircraft appeared at the CTANG starting with the F-47 (1947 to 1951) which was followed by the F-51 (1952 to 1956), the last AVGAS-powered aircraft at the Base. The F-84 was the first of a series of jet-powered aircraft that have been assigned to the CTANG. The F-84 was assigned to the Base during 1954-1955. The F-94s were introduced in 1956-57, followed by the F-86s in 1957 through 1959. The F-100s first appeared at the Base from 1959 to 1964 and again from 1971 to 1979. From 1965 to 1971, the F-102s were used. In 1979, the present aircraft, the A-10s, were assigned to the Base.

The function of the CTANG's 103rd TCS is to provide air traffic control for military aircraft. The Station at Orange/West Haven, Connecticut, was initially built and operated by the U.S. Army in 1957. Operation of the Station was transferred to the CTANG in 1962.

The CTANG has been conducting their off-base fire training exercises from 1953 to the present in a state-owned area that is estimated to be 600-feet northwest of the junction of Runways 19 and 24 at Bradley International Airport, Windsor Locks, Connecticut. This fire training area is under the jurisdictional control of the Bradley International Airport and is utilized by multiple users. The Base/Station conducts fire training exercises on a

quarterly basis using an estimated 1000-gallons of virgin JP-4 fuel for each exercise. Prior to each burn, a water base is applied to the training area. Prior to 1975, anything that would burn was used at this site. The Airport Fire Department conducts fire training exercises at least 2 times per year using an estimated 1000- to 1500-gallons of JP-4 fuel for each exercise.

Presently, the 103rd Tactical Fighter Group employs 922 military personnel and 265 Technicians. This Wing is supported by the 118th Tactical Fighter Squadron, the 103rd Tactical Control Squadron, the 103rd Consolidated Aircraft Maintenance Squadron, the 103rd Combat Support Squadron, the 103rd Tactical Dispensary, the 103rd Communications Flight, and the 103rd Civil Engineering Squadron.

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

1. 103rd TFG, Bradley International Airport

The annual mean temperature for Bradley International Airport is recorded as 49.8°F. July is the warmest month with a monthly mean of 73.4°F and an average monthly high of 84.8°F. January is the coolest month with a monthly mean of 25.2°F and an average monthly low of 16.7°F.

Monthly precipitation does not vary appreciably throughout the year. March and December have the highest monthly averages with 4.15 and 4.16 inches, respectively. February and July have the lowest monthly average with 3.19 and 3.09 inches, respectively. The average annual precipitation, as recorded at Bradley International Airport, is 44.39 inches. The recording station, the National Oceanic and Atmospheric Administration (NOAA) station No. 6-3456, is situated on airport property at 159 feet above mean sea level (MSL).

According to the Water Atlas of the United States (1973), Plate 12, the average annual evaporation from open water surfaces is 28 inches for the Base at Bradley International Airport. Using the method outlined in the Federal Register (47 FR 31224, 16 July 1982), the annual net precipitation is 16.4 inches for the Base. Rainfall intensity, based on the 1-year, 24-hour rainfall (47 FR 31235, Figure 8, 16 July 1982), is 2.6 inches for the Base.

2. 103rd TCS, Orange and West Haven, Connecticut

The Station is located less than two miles from Long Island Sound which has a moderating effect on its climate. There are no nearby NOAA stations to obtain exact records. The closest station, No. 6-0806 (Bridgeport), is located nine miles southwest of the Station. It is assumed that the

Bridgeport station, situated along the coast of Long Island Sound, should have a climate representative of the Orange/West Haven, Connecticut, Station.

The annual mean temperature for Bridgeport is recorded as 51.9°F. The warmest month occurs in July when the monthly mean is 74.0°F and the average monthly high is 82.1°F. The coolest month is January with a monthly mean of 29.5°F and an average monthly low of 22.5°F.

Monthly precipitation average values range from a high of 3.93 inches in March to a low in June of 2.90 inches. The average annual precipitation for the Station is recorded as 41.56 inches.

According to the Water Atlas of the United States (1973), Plate 12, the average annual evaporation from open water surfaces is 29 inches at the Station located at Orange/West Haven, Connecticut. Using the method outlined in the Federal Register (47 FR 31224, 16 July 1982), the annual net precipitation is 12.6 inches for the Station. Rainfall intensity, based on the 1-year, 24-hour rainfall (47 FR 31235, Figure 8, 16 July 1982), is 2.7 inches for the Station.

B. GEOLOGY

1. Geology at 103rd TFG, Bradley International Airport

The Base is located in the Lower New England physiographic subdivision of the Atlantic physiographic division and is within the Central Valley Lowland that is the Hartford Basin of the Newark Rift Valley Terrane. The Base is underlain by rocks of Triassic age that are veneered with Pleistocene and Recent deposits. These deposits are part of an elevated sand plain formed by ponded glacial meltwater lakes and associated deltas that have been dissected by several streams and rivers. The Base elevation is 172 feet above MSL.

The surficial geology map for the Windsor Locks Quadrangle (Colton, R.B., 1960) indicates two types of deposits occurring on the Base itself. The first of these deposits is called "Deltaic deposits", which covers 90 to 95 percent of the Base. The other deposit is called "Swamp deposits", which covers the remainder of the Base. Table 1 describes these deposits as well as the underlying bedrock.

Post-glacial action on the Bradley delta plain has resulted in the dissection of the sandplain by the drainage system of the Farmington and Connecticut Rivers. These delta deposits exhibit good surface drainage, generally high permeability, and good bearing capacity. They show little susceptibility to frost heave.

Table 2 shows well logs from two wells adjacent to the Base and gives a general idea of the types of surficial materials that underlie the area. Depth to bedrock varies from 90 feet near the southwest corner of the Base to about 170 feet near the northeast end of the Base (Handman, 1973).

The underlying bedrock is an upper Triassic formation called the Portland Arkose. Beneath that is the Hampden Basalt, the East Berlin formation, and the Holyoke Basalt. All of these formations are described in Table 1.

The soils at the Base belong to three different series. The following descriptions and map symbol abbreviations for these soils were taken from the Soil Survey of Hartford County, Connecticut and their locations are shown on Figure 7.

- MyA - Merrimac sandy loam. This soil is very friable and rapidly permeable and has a moderate moisture-holding capacity. Runoff is not a problem, but unprotected areas are subject to wind erosion in spring.

- SaA - Saco sandy loam, 0 to 3 percent slopes. This soil consists of frequently flooded, very poorly drained soils on flood plains. The surface soil is very dark gray to black silt loam to loamy sand. The

Table 1

Stratigraphy and Lithologic Descriptions in the Vicinity of
the Base at Bradley International Airport
in East Granby/Windsor Locks, Connecticut

AGE	DEPOSIT/FORMATION[1]	LITHOLOGIC DESCRIPTIONS
RECENT	Swamp Deposits (Qs)	Peat, muck, silt, sand, and clay. Grayish brown. As much as 25 feet thick but generally 5 feet thick. Crudely bedded, poorly sorted, not compacted, very plastic. Contains siliceous diatoms and spores. Organic content high (17.2 percent of sample lost during ignition test).
PLEISTOCENE	Deltaic Deposit (Qd)	Sand, silt, and gravel; very micaceous. Yellowish gray to light orange brown. As much as 70 feet thick but generally 30 feet thick. Local foreset bedding and crossbedding. Beds from one inch to one foot thick. Well sorted; poorly compacted. Some interfingering with lake deposits.
TRIASSIC	Portland Arkose (Trp)	Mostly reddish-brown arkosic siltstone, with some beds of reddish-brown arkose. Layers of medium-gray arkosic siltstone exposed along Stony Brook east of Guild Pond and between Taintor and Round Hills. Fossil wood occurs in gray siltstone at Stony Brook; dinosaur footprints on slabs of reddish-brown arkose below dam at Rainbow.
	Hampden Basalt (Trha)	Medium- to fine-grained, medium dark-gray to dark greenish-gray basalt. Vesicles and amygdules of calcite, prehnite, zeolites, and quartz common at most exposures. 100 to 150 feet thick.
	Eastern Berlin Formation (Treb)	Thinly bedded medium-gray to reddish-brown arkosic siltstone. 400 to 600 feet thick.
	Holyoke Basalt (Trha)	Dark greenish-gray fine- to medium-grained basalt. Upper part irregularly jointed; lower 150 to 200 feet columnar jointed. Vesicles and amygdules of calcite, prehnite, zeolites, and quartz common in upper 50 to 100 feet. Quartz, prehnite, calcite, datolite, pyrite, and zeolites occur as fracture filings. 250 to 300 feet thick.

[1] Sources: R.B. Colton, 1960, for Qs and Qd. R.W. Schnabel and J.H. Eric, 1964, for Trp, Trha, Treb, and Trha. Abbreviations in parenthesis are those utilized by these sources.

Table 2

Generalized Well Logs

A. 103rd TFG, Windsor Locks/East Granby, Connecticut

Well - East Granby, 225

Depth (ft)	Thickness (ft)	Description of Material Encountered
9	9	Fine sand
73	64	Clay; brown and gray
82	9	Till; clay and sand
85	3	Sand, granules, pebbles
95	10	Granules, pebbles
98	3	Till

Well - East Granby, 224

Depth (ft)	Thickness (ft)	Description of Material Encountered
12	12	Coarse sand
26	14	Fine to medium sand
31	5	Medium to coarse sand
42	11	Medium sand
49	7	Medium to coarse sand

Source: J.R. Stone, 1976

B. 103rd TCS, Orange/West Haven, Connecticut

Well - West Haven, 444

Depth (ft)	Thickness (ft)	Description of Material Encountered
18	18	Gravel and hardpan (till)
45	27	Hardpan (till)
129	84	Blue schist

Source: D.L. Mazzaferro, 1973

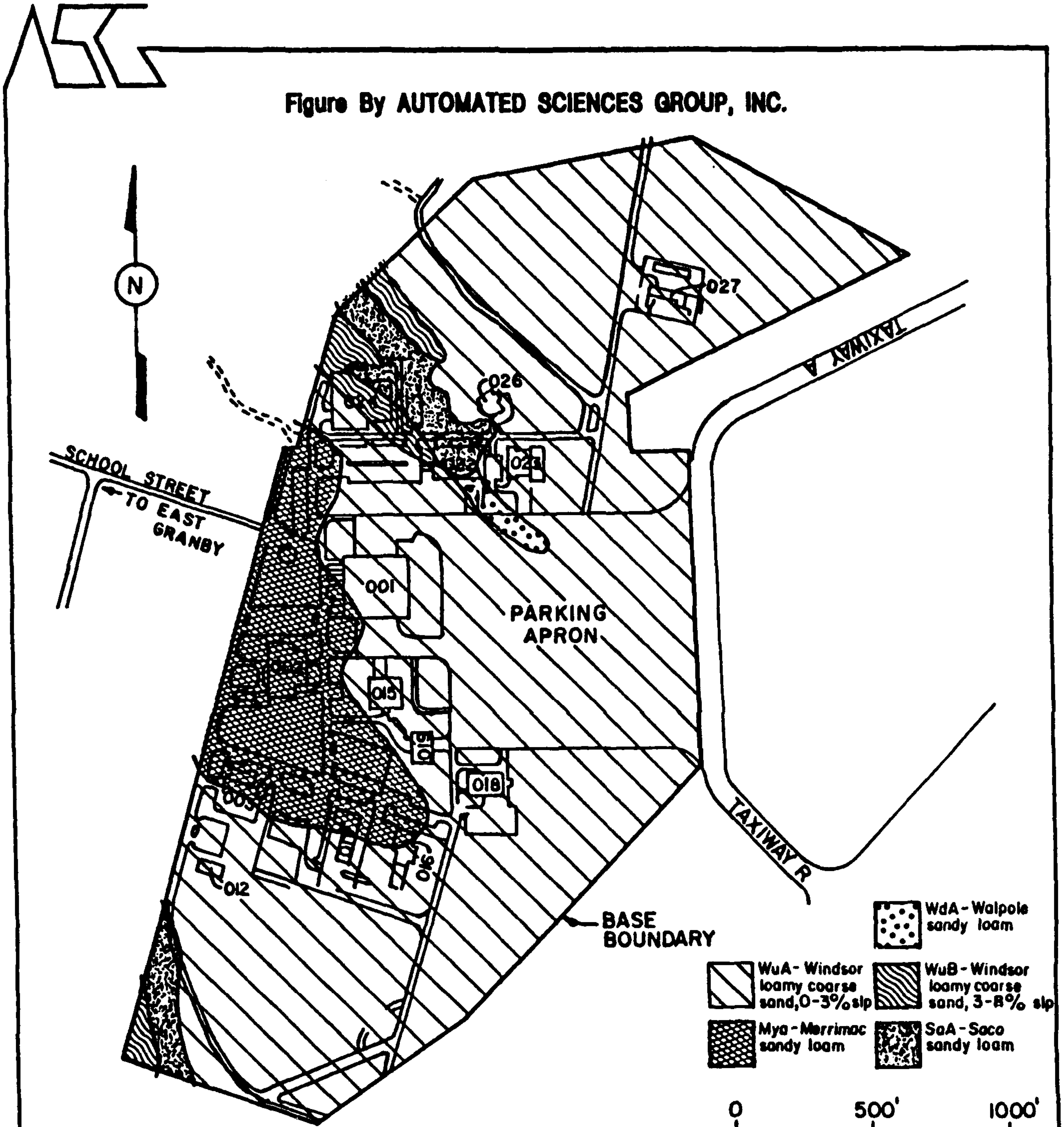


Figure 7. Soil Map for the 103rd TFG, CTANG, Bradley International Airport, Windsor Locks, Connecticut (1988).

subsurface is mottled mainly with gray. Water stands on the surface of most areas for long periods of winter and spring. The Saco soils have developed from a variety of sediments including some from reddish brown Triassic rocks. They generally occur in slight depressions that border terrace escarpments or uplands in old oxbows and narrow floodplains. A typical soil profile for Saco silty loam is presented here. It is similar to Saco sandy loam. It consists of 0 to 8 inches at the surface of very dark brown silt loam that is well matted with fine roots, has a moderate coarse granular structure, is slightly sticky when wet and is strongly acid. Next, from 8 to 18 inches, the soil is a grayish-brown silt loam mottled with very dark brown silt loam that is friable, sticky when wet, and strongly acid. From 18 to 22 inches, a gray silt loam is encountered that is finely mottled with a pale brown silt loam and is friable. The last layer, from 22 to 40 inches, is a mottled dark gray to light gray and pale brown light silt loam or very fine sandy loam that is very friable. Material below 2 feet ranges in texture from silt loam to coarse sand and gravel. In places, thin peaty layers occur below the surface. This soil is used mainly for forest, unimproved pasture, and wildlife. Drainage is generally not practiced because of the flooding and the lack of suitable outlets.

- WdA - Walpole sandy loam. This soil has slow to very slow runoff, and because of a seasonal high water table, it has slow internal drainage. The soil is relatively easy to drain because of the sandy, gravelly substratum. A typical soil profile would be partly decomposed forest litter up to 2 inches deep followed by black sandy loam to a depth of 7 inches with a very weak, medium granular structure that is very friable. From 7 to 10 inches the soil is a mottled, very dark grayish-brown and dark yellowish-brown sandy loam very friable. The next 10 to 22 inches of soil are mottled light-gray, brown, and very dark brown sandy loam, slightly firm in place but friable when disturbed. The last layer from 22 to 48 inches is made up of mottled light-gray, brown and yellowish-brown gravelly loamy sand with pockets of gravelly sandy loam.

- o WuA and WuB - Windsor loamy coarse sand, 0 to 3 percent slopes and 3 to 8 percent slopes, respectively. These soils generally have some fine gravel in the surface soil and subsoil and from 2 to 10 percent of fine gravel in the substratum. They absorb water rapidly, but unprotected areas are subject to some wind and water erosion. A typical profile would be from the surface to a depth of 8 inches of dark yellowish-brown loamy coarse sand with a small amount of fine gravel; very friable to loose. From 8 to 20 inches the soil is brown loamy coarse sand with a small amount of fine gravel with the color becoming paler with depth. From 20 to 24 inches it is yellowish-brown coarse sand with some gravel. The last layer, from 24 to 48 inches, is a grayish-brown and brown coarse sand with 5 to 6 percent fine gravel.

2. Geology at 103rd TCS, Orange and West Haven, Connecticut

The Station is located in the Lower New England physiographic subdivision of the Atlantic physiographic division. It lies in the southeast corner of the Western uplands that is the Connecticut Valley Synclinorium of the Oceanic Geologic Terrane of Connecticut. The Station is situated on the top of Marsh Hill which has an elevation of 245 feet above MSL. Some of the Station is located on the summit while the rest is situated on the west slope of Marsh Hill at elevations as low as 150 feet above MSL.

Marsh Hill is considered a drumlin, a hill that is entirely composed of glacial till. The surrounding valley floor is also glacial till. A generalized well log from a well located about 2000 feet southeast of the summit of Marsh Hill is presented in Table 2 (p. III-5). This well has a surface elevation of about 150 feet above MSL and reveals a depth to bedrock of 45 feet. If Marsh Hill is indeed composed entirely of glacial till, then the depth to bedrock at the Station could range from 150 feet at the summit to 50 feet or less along the lower reaches of the hill.

Beneath the surficial deposits the Station is underlain by a formation known as the "Allingtown Metavolcanics". Beneath this formation is the "Oranoque Schist". Table 3 describes these and other local geologic formations.

The soils at the Station belong to the Paxton series and are listed as fine sandy loam. The parent material from which the Paxton soils are derived includes schist, gneiss, and phyllite. These soils are further classified into the different slopes on which they occur. The <u>Soil Survey of New Haven County, Connecticut</u> (1979) uses the following symbols to delineate these soil types: PbB - Paxton fine sandy loam, 3 to 8 percent slopes; PbC- Paxton fine sandy loam, 8 to 15 percent slopes; PbD - Paxton fine sandy loam, 15 to 25 percent slopes. These soils are generally found on the top and sides of drumlins, hills, and ridges of glacial uplands. The following items are characteristic of these Paxton soils.

- A well drained soil on the tops and sides of drumlins, hills, and ridges of glacial uplands. Typically, the surface layer is dark brown fine sandy loam 8 inches thick. The subsoil is dark yellowish brown and olive brown fine sandy loam 18 inches thick. The substratum, to a depth of 60 inches, is olive, very firm gravelly fine sandy loam.

- Permeability is moderate in the surface layer and subsoil (0.6-2.0 inches per hour) and slow in the substratum (0.06-0.2 inches per hour). The available water capacity is moderate (0.08-0.20 inches per inch). Runoff is medium. This soil is strongly acidic to slightly acidic (pH from 5.1 to 6.5).

- The substratum is very firm and commonly has stones and boulders. The hazard of erosion is moderate.

C. HYDROLOGY

A discussion of the hydrology at both the Base and the Station is necessary in order to provide a framework for the possible pathways along which contaminants could travel. This subject is divided into two parts, surface

Table 3

Stratigraphy and Lithologic Descriptions in the Vicinity of the Station in Orange and West Haven, Connecticut

AGE	DEPOSIT/FORMATION[1]	LITHOLOGIC AND HYDROLOGIC DESCRIPTIONS
ORDOVICIAN	Maltby Lakes Metavolcanics, lower part (Omal)	Gray-green to green, fine-grained, generally well foliated greenschist, greenstone, and schist or phyllite, composed of albite and chlorite, plus quartz and sericite or epidote and actinolite. Mixed metavolcanic and metasedimentary rocks.
	Allingtown Metavolcanics (Oa)	Green, fine-grained, massive greenstone, composed of epidote, actinolite and chlorite, commonly with abundant megacrysts of saussurite, interlayed with minor green phyllite, generally containing quartz and sericite. Dark amphibole in western outcrops.
	Oranque Schist (Oo)	Gray to silver, medium- to fine-grained, well-layered to laminated schist and granofels, composed of quartz, oligoclase or albite, muscovite or sericite, biotite or chlorite, and in the western belt local garnet, staurolite, and kyanite. Small lenses of amphibolite or greenstone.

TH11148A/44

[1]Source used: J. Rodgers, Bedrock Geological Map of Connecticut, Connecticut Geological and Natural History Survey, Department of Environmental Protection, 1985, 2 sheets. Abbreviations in parenthesis are those utilized by this source.

water and ground water. This information is intended to be an aid in conceptualizing a pathways model to be used in the determination of possible waste migration.

Another purpose for considering the Base and Station hydrology is to assist in the determination of the possible reception of any contamination that could migrate along existing pathways.

1. Surface Water Hydrology of the 103rd TFG

Flood data for the Base were obtained from the National Flood Insurance Program map for East Granby, Connecticut. This map shows that the area in question does not lie in a floodplain associated with a 100-year flood.

Bradley International Airport is drained by several small streams and brooks that radiate away from the airfield. The streams on the south side of the airfield drain into the Farmington River which passes about one mile south of the Base and then travels seven or eight miles southeast before joining the Connecticut River. Kettle Brook drains some of the eastern edge of the airfield while making a due east run for two miles where it empties into the Connecticut River. All of the remaining streams that drain the west, north, and northeast sides of the airfield are part of the Stony Brook drainage basin. They eventually form or enter into Stony Brook which passes within a mile north of the northeast-southwest Runway and travels east where it empties into the Connecticut River. These drainage features can be seen on Figure 3 (page II-3). The dashed lines on Figure 3 indicate drainage divides in the vicinity of the Base. Storm water drainage on the Base itself is shown on Figure 8.

All surface water that drains the Base is part of the Stony Brook watershed which eventually reaches the Connecticut River just north of Windsor Locks. The storm sewer drainage system on the Base is composed of both covered and uncovered ditches. There are two discharge points where storm water leaves

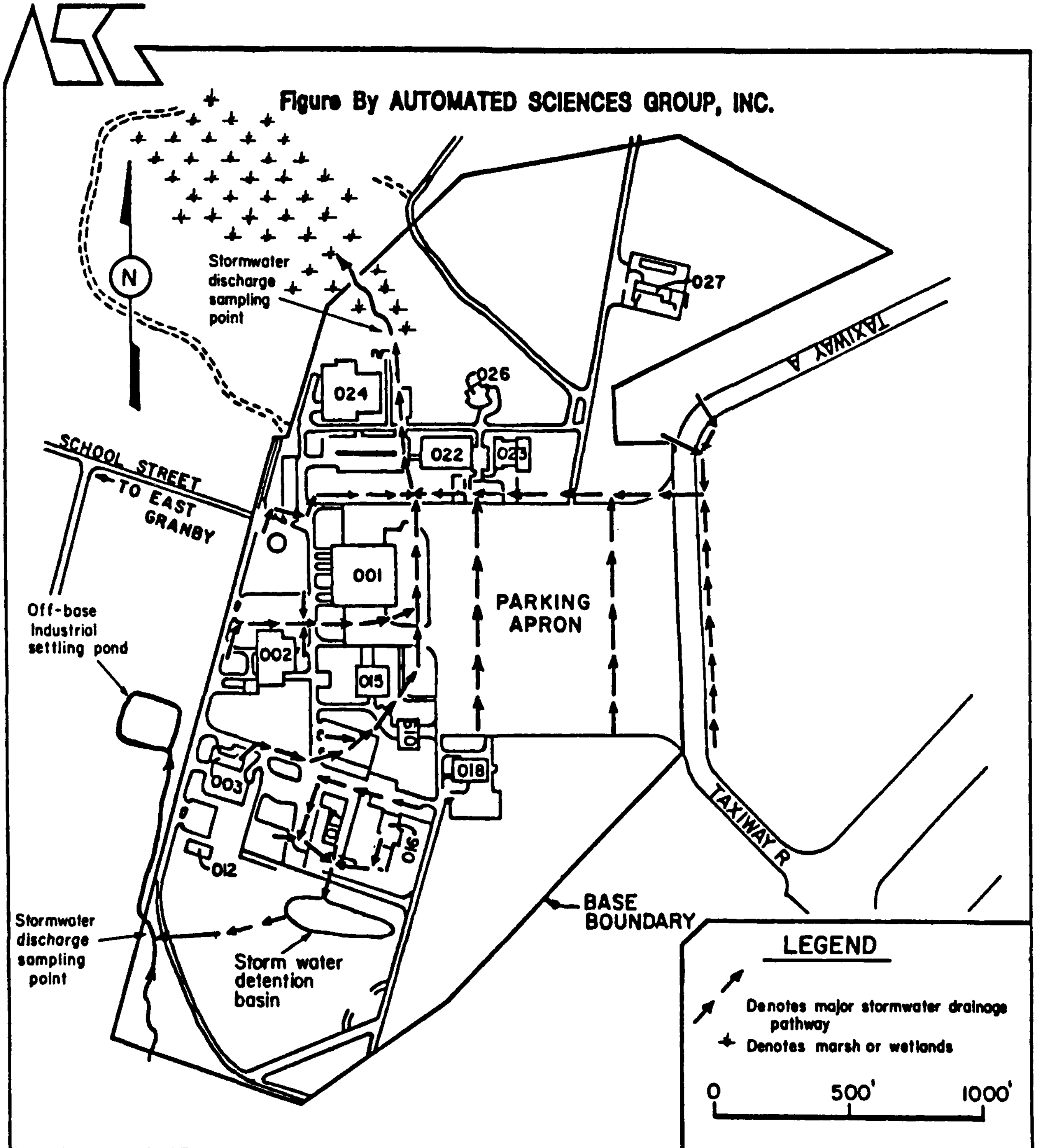


Figure 8. Drainage Map of the 103rd TFG, Bradley International Airport, Windsor Locks, Connecticut (1988).

the Base. These points are sampled bi-annually by the Base Environmental Health Technician. The drainage division between these points is an imaginary line running west to east across the Base. This line begins just south of the AGE Shop (Bldg. 003) and runs east but passes north of the Base Engineer Maintenance Shop (Bldg. 017). It then passes south of the parking lot associated with the Avionics Shop (Bldg. 018). All drainage from the Base area south of the drainage division line flows into an on-base stormwater detention basin before flowing off the Base at the southwestern discharge point. The storm sewer drainage for the northern portion of the Base passes through the northwestern discharge point. All of these drainage features can be seen on Figure 8.

2. Surface Water Hydrology of the 103rd TCS

Flood data for the Station were obtained from the National Flood Insurance Program maps for Orange and West Haven, Connecticut. These maps indicate that the area in question does not lie in a floodplain associated with a 100-year flood.

Drainage around the Station is generally radial away from the summit of Marsh Hill and down into the valley were two major streams receive the drainage. Silver Brook flows in a southwesterly direction along the northwest side of the Station while Oyster River flows in a southwesterly direction along the south side of the Station. These drainage features can be seen in Figure 4 (page II-4).

3. Ground Water Hydrology of the 103rd TFG

The surficial deposits underlying the Base and Bradley International Airport were probably formed in a post glacial meltwater lake and associated delta. The deltaic deposits located here tend to have good surface drainage with subsurface permeabilities ranging from high to low. These deposits are capable of yielding anywhere from 50 to 500 gallons per minute, depending on the percentage of silt in the screened water producing zone for a particular well. Out of four soil samples taken from the deltaic deposits, the average

silt content was less than nine percent with sand accounting for more than 90 percent of the soil.[1]

There are many industrial and some residential wells near the Base. These wells, when dug, reach refusal anywhere from 60 to 80 feet below the surface. Geotechnical investigations on the Base itself have encountered ground water at depths of five to ten feet below the surface.

4. Ground Water Hydrology of the 103rd TCS

Ground water is also obtainable around the Station at Orange, Connecticut. The surficial deposits in the area are till and stratified drift composed of mixtures of gravel, sand, silt, and clay. These deposits often have a water-saturated thickness of less than ten feet and are usually capable of yielding small to moderate amounts of water (up to 100 gallons per minute) to individual wells.

There are at least four domestic wells located within 3000 feet of the Station boundary. These wells generally have water levels of 10 to 20 feet below the surface. When pumped they yield from two to 20 gallons per minute with drawdowns of 50 to 400 feet. Most of these wells obtain water from the underlying crystalline bedrock.

D. CRITICAL ENVIRONMENTS

There are no known areas in the vicinity of the Base that are officially designated as critical habitats or wilderness areas, nor endangered or threatened species of flora or fauna. However, there is a major wetland within a one mile radius of the Base. This wetland area covers approximately 50 acres and has been designated as an area to be used for "National Emergency Use Only". This designation infers that this area will always be preserved unless the Department of Defense (DoD) needs the area to preserve its defensive mission. This area is bounded on the north by

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[1] Colton, 1960.

Russell Road, on the east by the Bradley International Airport, on the south by School Street, and on the west by East Street. This area can be seen on Figure 8 (page III-12).

There are no known areas in the vicinity of the Station that are officially designated as critical habitats or wilderness areas, nor endangered or threatened species of flora or fauna. The only wetland area within a mile of the Station is associated with Silver Brook. This area is southwest of the Station and can be seen on Figure 4 (page II-4).

IV. SITE EVALUATION

A. ACTIVITY REVIEW

A review of Base/Station records and interviews with past and present Base/Station employees resulted in the identification of specific operations within each activity in which the majority of industrial chemicals are handled and wastes are generated. Table 4 summarizes the major operations associated with each activity, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal methods for these wastes. The quantities listed for a particular shop may have been combined with another shop as indicated with the waste disposal practices assumed to be the same. It should be noted that supplies for the Station are obtained from the Base. Any resultant wastes are collected and returned to the Base for ultimate disposal. Information on the past disposal practices for the present location of the CTANG at Bradley International Airport is from 1979 until the present. From 1946 to 1979, the Base was located on the east side of the airport complex. In 1979, the Base moved to the west side of the airport complex. If an operation is not listed in Table 4, then that operation has been determined on a "best-estimate" basis to produce negligible quantities of wastes ultimately requiring disposal. A "process" designation implies that this material was utilized in a particular procedure by the Base/Station but no potentially hazardous waste was generated because the material was consumed in process or the material evaporated.

B. DISPOSAL/SPILL SITE IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

Interviews with 17 past and present Base personnel (16 ANG employees and 1 state employee) in addition to 4 present Station personnel (3 ANG employees and 1 state employee) who had an average tenure of 25 years and subsequent site inspections found that there are no disposal/spill/storage sites within the present leased boundaries of the Base or Station that might be potentially contaminated as the result of past waste handling activities.

Table 4. Hazardous Waste Disposal%Summary: 103rd TFG, Connecticut Air National Guard, Bradley International Airport, Windsor Locks, Connecticut

SHOP NAME	LOCATION (Bldg No.)	WASTE MATERIAL	CURRENT WASTE QUANTITY* Gallons/Year	METHODS OF TREATMENT, STORAGE, AND/OR DISPOSAL 1979 — 1988
Aircraft Maintenance	1	PD-680	Unk	Process
	15	Strippers (MEK, MIK) **	Unk	Process
	23	JP-4	50	Contr
		7808 Oil	20	Contr
		Hydraulic Oil	25	Contr
Aerospace Ground Equipment Maintenance (AGE)	3	Engine Oil	250	Contr
		Hydraulic Oil	25	Contr
		Paint Strippers (MEK, MIK) **	10	Contr
		JP-4	5	FTA
		PD-680	50	Contr
		Turbine Oil	15	Contr
		Motor Oil	40	Contr
		Battery Acid	40	Contr
		Deicer Fluid	50	Storm
		Antifreeze	50	San/Storm
		Brake Fluid	4	Contr
Vehicle Maintenance (Motor Pool)	16	Engine Oil	500	Contr
		PD-680	300	Contr
		Battery Acid	25	Neutr/San
		JP-4	200	Contr
		Antifreeze	100	San/Storm
		Lubricating Oil	25	Process
		Hydraulic Oil	25	Contr
		Transmission Fluid	25	Contr
		Paint Thinner	5	Process
		Brake Fluid	1	Contr
		Diesel Fuel	10	Contr
		Engine Degreaser	50	Process
		Trichloroethane	1	Process

Table 4 (cont.)

SHOP NAME	LOCATION (Bldg No.)	WASTE MATERIAL	CURRENT WASTE QUANTITY* Gallons/Year	METHODS OF TREATMENT, STORAGE, AND/OR DISPOSAL 1979 — 1988
Fuel Management	13	JP-4	5000	FTA
Non-Destructive Inspection (NDI)	23	Penetrant	Unk	Process
		Emulsifier	Unk	Process
		Developer	10	Contr
		Fixer	10	Sil Rec/San
		Trichloroethylene	Unk	Process
		Magnetic Inspection Fluid	20	Contr
Weapons Maintenance	8	Rifle Bore Cleaning	1	Process
	10	Thinners/Lacquers	Unk	Process
	11	MEK	Unk	Process
	18	PD-680	800	Contr
	27			
Corrosion Control	15	Thinners	6	Contr
		Paint Strippers	165	Contr
		Lacquer	12	Contr
		Acids	20	Neutr/San
		MEK	25	Contr
Paint Shops	3	Solvents	(Corrosion Control/AGE)	Contr
	15	Thinners	(Corrosion Control/AGE)	Contr
	16	Paint Containers	30 ea	Dumpster
		Acetone	Unk	Process
		Strippers (MEK, MIK) **	(Corrosion Control)	Contr
		Stripper Residue	150	Contr
		Paints	30	Contr

Table 4 (cont.)

SHOP NAME	LOCATION (Bldg No.)	WASTE MATERIAL	CURRENT WASTE QUANTITY* Gallons/Year	METHODS OF TREATMENT, STORAGE, AND/OR DISPOSAL 1979 — 1988
Entomology	17	Pesticides	50	Ground/Process
		Pesticide Containers	10 ea	Dumpster
		Rinse Water	20	Ground/Process
Hangar Spaces	1	JP-4	(Aircraft Maintenance)	Contr
	15	PD-680	(Aircraft Maintenance)	Process
Photo Lab	1	Developer	10	Neutr/San
		Fixer	Unk	Sil Rec/San
Flight Simulator	26	Hydraulic Fluid	2	Contr
Propulsion Shop	23	PD-680	400	Contr
		7808 Oil	200	Contr
		Cleaning Solution	Unk	Process

Key:
- Storm - Disposed of in drains leading to storm sewer.
- Process - Used in process.
- Contr - Disposed of through Hazardous Waste Contractor or Defense Reutilization and Marketing Office (DRMO).
- San - Disposed of in drains leading to sanitary sewer.
- Neutr/San - Neutralized and disposed of through sanitary sewer.
- Sil Rec - Silver recovery on base.
- Dumpster - Disposed of in approved trash receptacle.
- FTA - Burned at Fire Training Area located off-site.
- Ground - Disposed of on ground.
- Unk - Unknown quantity.

* This quantity may or may not reflect past practices
** MEK = Methyl Ethyl Ketone; MIK = Methyl Isobutyl Ketone

If there were any contamination, the migration pathway of primary concern is the ground-water route, and the most likely potential human receptors are owners of residential wells near the Base. The nearest of these wells is estimated to be 2000 feet north-northwest of the Base.

C. OTHER PERTINENT INFORMATION

- There are 31 Underground Storage Tanks (USTs) on the CTANG's leased property at the Bradley International Airport for which the ANG is responsible (Appendix D). Six of these tanks are associated with Oil/Water Separators (OWS). With the exception of the OWS servicing the AGE Shop (Building 3), the oil-free fraction from these OWS goes to the sanitary sewer system. The OWS for Building 3 connects with the storm drainage system. All USTs are currently in service and there have been no reported leaks in any of them.

- There are 15 Underground Storage Tanks (USTs) on the CTANG's leased property at the Station in Orange/West Haven, Connecticut, for which the ANG is responsible (Appendix D). There are only two Oil/Water Separators at the Orange, Connecticut, site. The oil-free fraction from both of these OWS enters the sanitary sewer system. With the exception of the UST located between Buildings 8 and 9, all USTs are currently in service and there have been no reported leaks in any of them.

- There is an abandoned 2000 gallon UST located between Buildings 8 and 9 at the Station in Orange/West Haven, Connecticut. This UST was filled with water in 1985 after all residual fuel was removed.

- Sample results from the Base/Station water quality program have shown no evidence of contamination resulting from Base/Station discharges into the storm drainage ditches.

- There are no landfills, nor have there ever been, or radioactive burial sites, or sludge burial sites on the Base or the Station.

- There are no active water wells on the Base or on the Station.
- Drinking water supplies at the Base and the Station are provided by publicly-owned facilities.
- Sanitary sewage at the Base and Station is connected to publicly-owned treatment works.
- There have never been any known leaks of oils containing PCBs on the Base/Station.
- There has not been extensive use or storage of herbicides/pesticides on the Base/Station. Application of these materials is done by Connecticut state employees.
- The nearest residential water well is estimated to be 2000 feet north-northwest of the Base. There are other such wells slightly more than 0.5 miles west-southwest of the Base.

V. CONCLUSIONS

- Information obtained through interviews with 21 past and present Base/Station personnel, review of Base/Station records, and field observations did not identify any potential disposal/spill/storage sites or leaking USTs within the present leased boundaries of the Base/Station.

- No sites have been scored using the Air Force HARM assessment methodology.

- The overall ground-water and geologic environment could make the underlying aquifers susceptible to any future contamination from surface sources. Geologic characteristics at the Base/Station contributing to this susceptibility include the presence of moderately permeable soil and a shallow ground-water table. The water table is generally within less than 10 feet of the surface at the Base.

- The most likely receptors of any future potential ground-water contamination are local residences whose wells are screened closer to the surface of the water table or are far enough downgradient* (assumed) from the Base so as to allow downward migration of possible contaminants. The nearest of these wells is approximately 2000-feet north-northwest of the Base while additional wells are located slightly more than 0.5 miles west-southwest of the Base.

- Sample results from the Base/Station water quality monitoring program have shown no evidence of contamination resulting from CTANG discharges into storm drainage ditches.

* Note: All ground-water flow gradients referred to in this report are assumed from regional flow, topographic, and geologic information. Actual site specific gradients beneath the Base are not yet known.

VI. RECOMMENDATIONS

Based on the investigation documented in this PA, it is recommended that no further IRP action be implemented for the Base or Station.

GLOSSARY OF TERMS*

ALLUVIUM - A general term for unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its floodplain or delta or as a cone or fan at the base of a mountain slope. These deposits are often deposited during a flood event and range from clays to gravels.

AMPHIBOLITE - Dark colored, fine- to coarse-grained, massive to poorly layered metamorphic rock containing amphibole and plagioclase with little or no quartz.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct ground water and to yield economically significant quantities of ground water to wells and springs.

AQUITARD - A confining bed (deposit) that retards but does not prevent the flow of water to or from an adjacent aquifer.

ARKOSE - Red to brown, medium- to coarse-grained, sandstone-like, sedimentary rock containing quartz, feldspar, and rock fragments. It is the most common sedimentary rock of the Central Lowlands of Connecticut; locally known as brownstone. Brownstone was quarried for use as building stone.

AVAILABLE WATER CAPACITY - Also called the available moisture capacity it is defined as the capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

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* Source for most of the glossary definitions was Robert L. Bates & Julia A. Jackson, Editors, Glossary of Geology, Second Edition, American Geological Institute, Falls Church, VA, 1980.

BASALT - A general term for dark colored mafic igneous rocks that are commonly extrusive but locally intrusive (e.g., as dikes), composed chiefly of calcic plagioclase and clinopyroxene. Basalt is the fine-grained equivalent of gabbro.

BEARING CAPACITY - The load per unit area that a material will support, especially soil.

CLASTIC - Pertaining to rock or sediments primarily composed of broken fragments derived from pre-existing rocks or minerals that have been transported a considerable distance from their place of origin.

COBBLE - A rock fragment larger than a pebble and smaller than a boulder.

CONGLOMERATE - A course-grained clastic sedimentary rock composed of rounded/subangular rock fragments larger than 2 millimeters (mm) in diameter set in a matrix of fine grained silt or sand.

CONTAMINANT - As defined by Section 101(f)(33) of SARA shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under the following:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act;

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act;

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress);

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act;

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act; and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquified natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CRITICAL HABITAT - The native environment of an animal or plant which, due to either the uniqueness of the organism or the sensitivity of the environment, is susceptible to adverse reactions in response to environmental changes such as may be induced by chemical contaminants.

CROSS-BEDDING - The arrangement of strata inclined at an angle to the main stratification where these cross-beds are more than one centimeter in thickness.

DELTAIC - Pertaining to or characterized by a delta.

DIATOM - A unicellular aquatic plant related to algae. Some of the deposits containing diatoms may have formed in lake beds although most are of marine origin.

DISCHARGE - The release of any waste stream, or any constituent thereof, to the environment that is not recovered. Also, when pertaining to wells, the rate of flow of ground water from a pumped well or an artesian well.

DOWNGRADIENT - A direction that is topographically or hydraulically down slope; the direction in which ground water flows.

DRIFT (STRATIFIED) - Glaciofluvial, glaciolacustrine unconsolidated rock debris consisting of sorted and layered material deposited by a meltwater stream or settled from suspension in a body of quiet water adjoining the glacier.

DRIFT (UNSTRATIFIED) - A term applied to all rock material ranging in size from clay to boulders that were transported and deposited by glacial action and which exhibit no layering of strata. An example would be the glacial till that form moraines.

DRUMLIN - A low, smoothly rounded, elongated oval hill, mound, or ridge of compact glacial till. Its longer axis is parallel to the direction of movement of the ice. It usually has a blunt nose pointing in the direction of movement from which the ice approached and a gentler slope tapering in the other direction.

EXTRUSIVE - Said of an igneous rock that has been erupted onto the surface of the Earth and includes lava flows and pyroclastic material such as volcanic ash.

FAULT BLOCK - A crustal unit formed by block faulting bounded by faults either completely or in part. Normal faulting is common. The term "normal fault" is used when the hanging wall appears to have moved downward relative to the footwall and the angle of the fault is usually 45-90°.

FOLIATED - A structural feature of certain rocks, particularly those that have undergone some degree of metamorphism, and that are characterized by a planar arrangement of the mineral grains that make up the rocks.

FRIABLE - A material such as soil or rock that crumbles naturally or is easily broken or crushed.

FORESET BEDDING - A synonym of cross-bedding.

FORMATION - The fundamental formal unit of classification according to lithology and stratification.

FROST HEAVING - The uneven upward movement, and general distortion of surface soils and structures such as pavements due to subsurface freezing of water and growth of ice masses.

GLACIAL OUTWASH - Stratified detritus (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited beyond the end moraine of a glacier.

GRABEN - An elongate, relatively depressed crustal unit or block that is bounded by faults along its long sides.

GRANOFELS - Light to dark, medium- to coarse-grained, massive to poorly layered metamorphic rock composed primarily of quartz and feldspar; lacking the compositional banding of a gneiss.

GREENSTONE - Any compact darkgreen altered or metamorphosed basic igneous rock such as basalt, gabbro, or diabase that owes its color to the presence of chlorite, actinolite, or epidote.

HARDPAN - A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial

action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

HAS - Hazard Assessment Score - The score developed by utilizing the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, physical, chemical, or infectious characteristics may

a. cause, or significantly contribute to, an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or
b. pose a substantial threat or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

IGNEOUS - Rock material of molten origin.

INTERFINGERING - The disappearance of sedimentary bodies in laterally adjacent masses owing to splitting into many thin tongues which pinch-out independently.

INTRUSIVE - Of or pertaining to igneous intrusion which is the process of emplacement of magma in pre-existing rock.

LACUSTRINE - Pertaining to, produced by, or formed in a lake environment.

LITHOLOGY - The physical character of a rock (e.g., particle size, color, mineral content, primary structures, thickness, weathering characteristics, and other physical properties).

LOAM - Soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

MEGACRYST - A general term for a crystal in an igneous or metamorphic rock that is significantly larger than the surrounding matrix or groundmass.

METASEDIMENTARY - A sedimentary material/rock that shows evidence of having been exposed to metamorphism.

METAVOLCANIC - Volcanic material/rock that shows evidence of having been exposed to metamorphism.

MICACEOUS - Consisting of or pertaining to mica, the major phyllosilicate group of minerals.

MIGRATION (Contaminant) - The movement of contaminants through pathways (e.g., ground water, surface water, soil, and air).

MUCK - Well decomposed organic material intermixed with a high percentage of mineral matter, usually silt, that forms surface deposits in poorly drained areas and lake bottoms.

ORDOVICIAN - A period of the Paleozoic era after the Cambrian and before the Silurian generally thought to have covered the span of time between 500 and 440 million years ago.

PALUSTRINE - Pertaining to, produced by, or formed in a swamp environment.

PEAT - An unconsolidated deposit of semicarbonized plant remains in a watersaturated environment, such as a bog or fan.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

PHENOCRYST - A relatively large conspicuous crystal in a porphyritic rock.

PHYLLITE - A metamorphosed rock, intermediate in grade between slate and mica schist. Phyllites commonly exhibit corrugated cleavage surfaces and have a silky sheen on the cleavage surfaces due to the presence of minute platy minerals in the rock.

PLEISTOCENE - An epoch of the Quaternary period after the Pliocene of the Tertiary and before the Holocene. It began two to three million years ago and lasted until the start of the Holocene some 8000 years ago.

PLUTONIC - Pertaining to igneous rocks formed at great depth.

PORPHYRITIC - Said of the texture of an igneous rock in which larger crystals (phenocrysts) are set in a finer-grained groundmass which may be crystalline or glassy or both.

QUATERNARY - The second period of the Cenozoic era following the Tertiary. This period consists of the Pleistocene and Holocene epochs. It ranges from two or three million years ago to the present.

RECENT - Synonymous with Holocene, the epoch of the Quaternary period from 8000 years ago to the present.

RIFT VALLEY - A valley that has developed along a rift which is basically a graben of regional extent.

SAUSSURITE - A tough, compact and white, greenish, or grayish mineral aggregate consisting of a mixture of albite, and zoisite or epidote with variable amounts of calcite, sericite, and zeolites. It is produced by alteration of calcic plagioclase.

SERICITE - A mineral found in various metamorphic rocks such as schists and phyllites.

SCHIST - Light, silvery to dark, coarse- to very coarse-grained, strongly to very strongly layered metamorphic rock whose layering is typically defined by parallel alignment of micas. Primarily composed of mica, quartz, and feldspar; occasionally spotted with conspicuous garnets.

SHALE - A fine-grained detrital sedimentary rock formed by the consolidation of clay, silt, or mud.

SILICEOUS - Said of a rock containing abundant silica, especially as free silica rather than as silicates.

SILTSTONE - An indurated silt having the texture and composition of shale but lacking its fine lamination.

STRATIGRAPHIC (CLASSIFICATION) - The arbitrary but systematic arrangement, zonation, or partitioning of the sequence of rock strata in a region with regard to the many different characters, properties, or attributes which the strata may possess.

STRATUM - A section of a formation that consists throughout of approximately the same kind of material. Also a layer (of sediment) that was spread out horizontally with older layers below and younger layers above.

SUBSTRATUM - The part of the soil below the solum. The solum is the upper part of the soil profile, above the C horizon, in which the processes of soil formation are active. The living roots and other plant and animal life characteristics of the soil are mostly confined to the solum.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, lakes, and drainage ditches.

SYNCLINORIUM - A compound syncline; a closely folded belt, the broad general structure of which is synclinal.

TERRANE - An obsolescent term applied to a rock or group of rocks and to the area in which they crop out.

TILL - Dominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, and boulders ranging widely in size and shape.

TRIASSIC - The first period of the Mesozoic era. It is generally thought to have covered the time span between 225 and 190 million years ago.

UPGRADIENT - A direction that is topographically or hydraulically up slope.

VENEER - A thin but extensive layer of sediments covering an older geologic formation or surface.

VOLCANIC - Pertaining to the activities, structures, or rock types of a volcano. Some common minerals found in volcanic rocks are quartz, pyroxene, plagioclase, albite, biotite, calcite, chlorite, epidote, hornblende, and sericite.

WATER TABLE - The upper limit of the portion of the ground that is wholly saturated with water.

WETLANDS - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - Areas designated under federal or state laws as wilderness areas to be managed for their aesthetic or natural value.

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2. Bradley International Airport Master Plan, for the State of Connecticut Department of Transportation, Purcell-DeLeuw, Cather, 1977.

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17. J. R. Stone, Contribution 189, Unconsolidated Materials, Windsor Locks Quadrangle, Connecticut, Map MF-450E, U.S. Geological Survey, Connecticut Valley Urban Area Project, Environmental Geologic and Hydrologic Studies, 1973.

APPENDIX A

RESUMES OF ASG SEARCH TEAM MEMBERS

AUTOMATED SCIENCES GROUP, INC.

DAVID R. STYERS, P.E. - HEALTH PHYSICIST

PROFESSIONAL CAPABILITIES

Twelve years experience in program management that includes test planning, system design, training and management, research and development, and quality assurance/quality control. Expertise in radiation health physics that includes field surveys, safety reviews, hazard assessments, compliance reviews, and gamma spectroscopy (radiological chemical analyses). Conduct site surveys and records searches for Installation Restoration Program (IRP) for various Air National Guard bases. Efforts include risk assessment, site prioritization, and remedial action recommendations.

EDUCATION

M.S., Health Physics, Georgia Institute of Technology, Atlanta, 1985
Certified Professional Engineer in Civil Engineering
B.S., Education (Major, Chemistry, Minor, Physics), Slippery Rock College, Slippery Rock, PA, 1964

PROFESSIONAL EXPERIENCE

1987-Present Automated Sciences Group, Inc.
Health Physicist. Manage Tumulus Chemical and Nuclear Waste Disposal Task for ASG, including monitoring activities at Demonstration Site, SWSA-6. Prepare task implementation plans, maintain master schedule, and interface with clients at Oak Ridge National Laboratory. Active participation as a team member in Hazardous Waste Environmental Audits, Waste Minimization, and USAF Installation Restoration Program Projects.

1985-1987 Oak Ridge Associated Universities
Health Physics Team Leader. Directed on-site radiation survey teams throughout the United States; provided radiation safety assistance. Conducted complex radiological assays of samples; analyzed and interpreted data; prepared comprehensive reports of results. Reviewed safety procedures and engineering plans for decontamination of nuclear facilities and environmental impact documents. Conducted hazard assessments of radionuclides. Inspected operations and facilities for compliance with regulations.

1978-1985 Pennsylvania Department of Environmental Resources
Chemist. Performed qualitative and quantitative radioassay analyses by gamma spectroscopy techniques. Prepared and disposed of radioactive standards and samples in compliance with NRC regulations. Established quality control charts for radiation analyzers. Participated in quality assurance program of EPA's Environmental Surveillance Monitoring Laboratory; achieved 98% accuracy.

1974-1978 Pennsylvania Department of Transportation
Chemist. Supervised air monitoring section of Chemical Laboratory. Evaluated and selected test site locations for air monitoring projects;

trained staff in proper use of equipment. Scheduled laboratory and field testing. Designed mobile air monitoring vans. Prepared reports on air monitoring testing and research.

1968-1974 Pennsylvania Department of Transportation
Chemist. Supervised and performed qualitative and quantitative chemical monitoring activities.

1965-1968 Fairview Township Schools
Teacher. College preparatory Chemistry and Physics.

MEMBERSHIPS

American Nuclear Society
Health Physics Society

CLEARANCE

DOE-Q

AUTOMATED SCIENCES GROUP, INC.

WILLIAM L. CONDRA - SENIOR ENVIRONMENTAL ENGINEER

PROFESSIONAL SUMMARY

Over 23 years of experience in hazardous waste management involving sampling, coordinating resources, and managing the clean-up of hazardous chemical spills; hazardous waste minimization projects for various Naval facilities as mandated by DOD's Naval Energy and Environmental Support Activity (NEESA) and DOE's Hazardous Waste Remedial Actions Program (HAZWRAP); and site surveys and record searches for the Installation Restoration Program (IRP) for Air National Guard bases. Primary capabilities include extensive personnel and program management, scientific, engineering, and economic analyses of hazardous environments, industrial process analyses, performance of preliminary assessments, and environmental sampling and analytical protocol, including chain of custody.

EDUCATION

M.S., Industrial Technologies/Environmental and Safety Studies, Middle Tennessee State University, 1985
B.S., Chemistry, Middle Tennessee State University, 1961
Certified Hazardous Materials Manager, 1986
Certified Hazardous Materials Technician, 1986
Certified Practices and Procedures for Asbestos Control, 1986
Registered Professional Environmentalist, 1976

PROFESSIONAL EXPERIENCE

1988-Present Automated Sciences Group, Inc.
Senior Environmental Engineer, Hazardous Waste Minimization for Robins Air Force Base. Managerial responsibilities involve coordination, project review, and manpower/cost requirements determination. Environmental responsibilities include conducting Hazardous Waste Minimization Surveys at U.S. Air Force bases, investigations, audits, operational analyses, and hazardous waste sampling, in addition to conducting preliminary assessments at Air National Guard bases. Conduct installation records reviews; prepare environmental reports; maintain liaison with support contractors and client; provide coordination with state and federal agencies; and advise the client and ASG on compliance with EPA, DOT, and OSHA regulations.

1987-1988 The EC Corporation, Knoxville
Project Manager/Senior Environmental Engineer. Managed contractual projects for optimizing hazardous waste generation and facility retrofitting for Hard Chrome Plating operations at Naval facilities. Supervised engineers and provided coordination with Naval facility representatives to ensure completion of contract Statement of Work requirements for Naval Energy and Environmental Support Activity (NEESA).

1981-1987 Arnold Engineering Development Center (AECD), Tullahoma
Environmental Specialist. Responsible for interpreting and ensuring compliance of AEDC's environmental program with applicable state, federal (EPA, OSHA, DOT), and Air Force regulations. Activities included supervising, coordinating, consulting, statistical monitoring, inspecting, sampling, and reporting environmental accomplishments and discrepancies to proper Air Force and associated contractor personnel. Served as a specialist in the chemistry of toxic and hazardous waste. Investigated oil and hazardous chemical spill releases and managed the disposal of hazardous waste chemicals. Initiated cost savings of $80,000 to U.S. Air Force.

1974-1981 State of Tennessee, Bradley County Health Department
Environmentalist II/Chemist II. Supervised, promoted, and inspected projects for compliance with Tennessee environmental regulations. Managed startup of an analytical laboratory for monitoring water quality in public school system including potable water and domestic sewage.

1965-1974 Beaunit Fibers, Inc., Etowah, TN
Senior Chemical Control Engineer/Chemical Laboratory Area Supervisor. Responsible for improving Nylon 6/6 polymerization process performance and yield through process modifications involving polymerization rate studies and lubricant formulation changes. Implemented startup of a manageable quality control program resulting in an annual savings of $900,000. Coordinated customer complaints with manufacturing process engineers for corrective actions. Supervised and managed startup of an analytical laboratory and additive preparation area with an annual budget of $1M.

1961-1965 B.F. Goodrich Chemical Company, Calvert City, KY
Chemist. Supervised laboratory technicians; developed procedures for gas chromatography and wet chemistry techniques. Implemented quality control testing for incoming raw materials and finished products.

AFFILIATIONS

Institute of Hazardous Materials Management
Institute for Environmental Career Advancement
Tennessee Department of Health and Environment

CITIZENSHIP

U.S.

CLEARANCE

DOD - Secret (Inactive)

AUTOMATED SCIENCES GROUP, INC.

T. WARD DILWORTH - ENGINEER

PROFESSIONAL CAPABILITIES

Combined background in Geology and Civil Engineering with emphasis on the geotechnical and environmental difficulties encountered in soil, rock, ground water, and similar hydrologic situations. Experience in preparation of proposals and technical reports and laboratory and field testing of soils and concrete. Assist in the conduct of site surveys and records searches for Installation Restoration Program (IRP) for various Air National Guard bases. Efforts include data compilation, risk assessment, site idetification, and site prioritization.

EDUCATION

B.A., Geology, University of Tennessee, 1984
B.S., Civil Engineering, University of Tennessee, 1987
Engineer In Training (E.I.T) Certification, State of Tennessee, 1987

PROFESSIONAL EXPERIENCE

1987 - Present Automated Sciences Group, Inc.
Engineer. Involved in Martin Marietta's site characterization investigations for the low-level waste disposal demonstration project. Duties encompass part of the ground-water characterization for the project and include monitoring ground-water levels on three sites, recording well details as they are finished, and transfer of collected data.

Also involved in development of ground-water computer modeling program. Assisted in survey of certain buildings at ORGDP to obtain information used to place those buildings in safe storage. Engaged in studies involving underground waste storage tanks, and assigned to five Preliminary Assessment projects for the Installation Restoration Program (IRP) for the Air National Guard Bureau (ANGB).

1986 - 1987 Law Engineering
Engineering Aide, Laboratory and Field Technician. Assisted senior engineering staff in preparation of technical reports and proposals. Checked field reports, prepared engineering drawings, and provided input on geologic considerations included in reports and proposals. Conducted laboratory and field tests on soil (in situ density, proctor test, freeze/thaw and wet/dry cycles on soil-cement samples, water content, and collecting bag samples) and concrete (compression testing of cylinders, making concrete cylinders, making grout cubes, slump testing, air content, density/unit weight). Assisted drilling crew in auger drilling operations and laying out borehole locations.

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

Contact List for Local, State, and National Agencies

Soil Conservation Service for New Haven County
New Haven Agricultural Center
322 North Main Street
Wallingford, Connecticut 06492
(203) 269-7509
Information obtained: Soil survey of New Haven County

State of Connecticut Department of Environmental Protection
Natural Resources Center
Map and Publication Sales
165 Capitol Avenue Room 555
Hartford, Connecticut 06106
(203) 566-7719
Information obtained: Soil information for Hartford County, geologic maps and reports, hydrogeologic information, well logs.

Natural Diversity Database
165 Capitol Avenue Room 553
Hartford, Connecticut 06106
(203) 566-3540
Information obtained: Data on state critical habitats, endangered species, and critical resources.

National Climatic Data Center
Federal Building
Asheville, North Carolina 28801
(704) 259-0682
Information obtained: Climate/Meteorology for Connecticut

State of Connecticut Department of Environmental Protection
Water Resources Unit, State Office Building
165 Capitol Avenue Room 201
Hartford, Connecticut 06106
Information obtained: Flood zone information

APPENDIX C

USAF HAZARD ASSESSMENT RATING METHODOLOGY

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is as follows:

> To develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF), using information gathered during the Preliminary Assessment (PA) phase of its Installation Restoration Program (IRP), has sought to establish a system of priorities for taking actions at identified sites.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites suspected of contamination from hazardous substances. This model will assist the Air National Guard (ANG) in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (i.e., hazardous wastes are present in sufficient quantity) and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like other hazardous waste site ranking models, the USAF site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed by using the appropriate ranking factors according to the method presented in the flow chart (see Figure 1). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by specific sites: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contamination migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site and the distance between the site and the Base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within three miles of the site. The uses of the surrounding area are determined by the zoning within a one mile radius. Determination of whether or not critical environments exist within a one mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The

maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptor subscore = (100 x factor score subtotal/maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and ground-water migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned; and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered species; threatened species; presence of recharge area; major wetlands	10

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Scale Levels

Rating Factors	0	1	2	3	Multiplier
F. Water quality / use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Scale Levels

Rating Factors	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability, and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS - Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules

Confidence Level

- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard rating can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, groundwater, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net Precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year, 24-hour rainfall (Thunderstorms)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-35 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100	8

B-2 Potential for Flooding

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Depth to ground water	Greater than 500 feet	51 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($>10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/Water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete, the factor ratings under items I-A through I, III-B-1, or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX D

UNDERGROUND STORAGE TANK SURVEY

STORAGE TANK SURVEY

This appendix is a general survey of the storage tanks on the CTANG installations at Bradley International Airport and at the radar site in Orange, Connecticut. The following table lists these tanks, their location, size, age, contents, and building or facility served. The accompanying listing from the CTANG also addresses type of construction, protection, date taken out of service (if abandoned), and record of leaks.

Underground Storage Tank Listing for CTANG,
Bradley International Airport, Windsor Locks, Connecticut
and Orange, Connecticut

Facility Number	Tank Number	Capacity (Gallons)	Year Installed in Ground	Contents	Building or Facility Served	Remarks
3	--	2	1952	Waste Oil	AGE	Oil Separator
	1	1,000	1972	JP-4	AGE	
	2	10,000	1952	MOGAS	AGE	
4	1	15,000	1952	Fuel Oil	Boiler Room	
	2	15,000	1952	Fuel Oil	Boiler Room	
6	1	25,000	1957	JP-4	POL Pump House	
	2	25,000	1957	JP-4	POL Pump House	
	3	25,000	1957	JP-4	POL Pump House	
	4	1,000	1957	JP-4	POL Pump House	Overflow tank for Tanks 1-3
	5	1,000	1981	JP-4	POL Parking Area	Fuel spill holding tank
8	1	1,000	1953	Fuel Oil	Security	
10	1	1,000	1960	Fuel Oil	Base Exchange	
11	1	500	1979	Solvents	Alert Hangar	
13	1	550	Unknown	Fuel Oil	POL Office	
14	1	1,000	1983	Fuel Oil	Mobility Storage	
15	2	1,000	1979	Fuel Oil	Corrosion Control	
	2	550	1979	Waste Oil	Corrosion Control	
	--	2	1979	Waste Oil	Corrosion Control	Oil Separator
	3	1,500	1979	Paint Stripper	Corrosion Control	
16	1	550	1980	Waste Oil	Motor Pool	
	--	2	1981	Waste Oil	Motor Pool	Oil Separator
17	--	2	1981	Waste Oil	Base Engineer Maintenance Shop	Oil Separator
19	--	2	1981	Waste Oil	Fire Station	Oil Separator
23	--	2	1980	Waste Oil	Aircraft Engine/ NDI Shops	Oil Separator
	1	550	1979	Waste Oil	Aircraft Engine/ NDI Shops	
	2	550	1979	Solvents NDI Shops	Aircraft Engine/	

Facility Number	Tank Number	Capacity (Gallons)	Year Installed in Ground	Contents	Building or Facility Served	Remarks
27	1	2,000	1980	Fuel Oil	Munitions	
50	1	1,000	Unknown	Fuel Oil	State Office	
758	1	550	1984	Fuel Oil	State Warehouse	
10382	1	500	1952	Sewage	Pump Station	
10834	1	500	1960	Sewage	Pump Station	

The following underground storage tank listing is for the CTANG's 103rd Tactical Control located at Orange, Connecticut.

Facility Number	Tank Number	Capacity (Gallons)	Year Installed in Ground	Contents	Building or Facility Served	Remarks
3	1	550	1956	Fuel Oil	Shop	
6	1	1,000	1956	Fuel Oil	Motor Pool	
	2	5,000	1980	Diesel Fuel	Motor Pool	
	3	2,000	1956	MOGAS	Motor Pool	
	4	1,000	1986	Waste Oil	Motor Pool	
	---	275	Unknown	Waste Oil	Motor Pool	Oil Separator
7	1	1,500	1956	Fuel Oil	Operations	
8	1	1,000	1982	Fuel Oil	Mess Hall	
	2	2,000	1956	Water	Mess Hall	ABANDONED
9	1	1,500	1956	Fuel Oil	Maintenance	
10	1	2,000	1956	Fuel Oil	Supply	
11	1	1,000	1956	Fuel Oil	Administration	
13	1	6,000	Unknown	JP-4	POL	
17	1	3,000	1978	Fuel Oil	AGE Shop	
	2	275	1978	Waste Oil	AGE Shop	Holding Tank for Oil/Water Separator